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9223

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3. Full name, address and postcode of the or of each applicant *(underline all surnames)*

MILLIKEN INDUSTRIALS LIMITED
BEECH HILL PLANT
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08408364009
Patents ADP number *(if you know it)*

If the applicant is a corporate body, give the country/state of its incorporation

ENGLAND

4. Title of the invention

MAT

5. Name of your agent *(if you have one)*

"Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*

STEPHEN BRISTOW
MILLIKEN INDUSTRIALS LIMITED
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11. I/We request the grant of a patent on the basis of this application.

Signature S.R. Bristow — Date 12 June 2002

12. Name and daytime telephone number of person to contact in the United Kingdom: STEPHEN BRISTOW 01942 61 2959

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MAT

Technical Field

This invention relates to mats, in particular to elastomer or rubber backed mats and most particularly to tufted pile textile surfaced mats with rubber backing, suitable for use as floor mats.

Background to the Invention

Tufted pile textile surface mats with elastomer backings are used as floor mats and as bar runners or drinks mats. Elastomer backed floor mats compete with other floor mat products that are sold through three different trade channels and which have different user requirements. The trade channels being: retail, commercial and industrial or rental. Industrial or rental mats are typically owned by a laundry and are normally nitrile rubber backed with a tufted pile textile surface and an exposed rubber border. Commercial mats and retail mats are sometimes nitrile rubber backed too, but rubber backed mats only form about 5% of the total sales of mats in these two categories. The remainder of the commercial and retail matting is either not backed or is backed with PVC or latex. Commercial and retail mats are rarely washed. Commercial matting is often fitted into a mat well. Retail mats are often used over carpeting in the home.

Although rubber backed mats have enjoyed much success in the industrial category where their high performance is a requirement, their market penetration in the commercial and retail categories has been hampered by their relatively high cost coupled with the generally lower performance requirements of those markets. A further problem has been that the traditional manufacturing process for rubber backed pile surfaced mats has meant that the mat suffers from pile crush which reduces soiling performance until the mat has been washed which causes the crushed pile to recover. This is acceptable for the rental market where washing the mat before first use is normal but it is unacceptable for the retail or commercial markets where washing is not normally carried out. The problem of pile crush is particularly apparent on polypropylene pile material. A good quality pile with little or no crush is also a big factor for success in the commercial mat sector.

EP 0135595 describes a method for manufacturing a floor covering in the form of a web, which may be used as a sports surface. The web consists of a lower textile base and an upper layer of compressed disintegrated waste rubber and/or granules of new or scrap rubber which has been mixed with a pre-polymer as a solvent-free single-component binder and cured.

DE 4212757 describes a moulded component forming an elastic layer and comprising a mixture of granulated recycled material and binders. The component has three compressed layers of uniform thickness bonded together at their interfaces. Upper and middle layers are formed by flat

plates and the lower layer has hump-shaped feet separated by grooves. The individual layers are formed in different materials with different particle sizes. The component can be used as a covering e.g. for floors.

A mat with a compression moulded rubber crumb backing and having a flock surface applied to the backing is available under the brand name "Royal mat". Compression moulding at high pressure means that this type of mat cannot easily be provided with a tufted pile surface unless it is added as a second process stage. By compression moulding we mean that the rubber crumb is compressed it is constrained from movement, including lateral movement, by means of a mould. Compression moulding gives a rubber crumb backing rubber that has a high density and low deformability. This makes the mat heavy and inflexible and it will not conform well to the shape of the floor beneath it. A tufted pile surface is desired for many retail and commercial applications because it has the best look and feel and it has good dirt and moisture retaining properties. Tufted pile can also be printed to give it a pattern, or it can be tufted into a pattern, both of which are superior to mats using textile surfaces such as flocked pile or coir mats.

Rubber carpet underlay manufactured from lightly bonded crumb rubber is known. This underlay is made without any significant pressure and as a result it is not sufficiently well bonded to make it durable enough to be used as a mat backing.

It is desirable to provide retail and/or commercial floor mats or matting products that meet or exceed the specifications of PVC backed mats in terms of performance and cost, while avoiding the environmental concerns associated with PVC. PVC backed mats are often mistaken for rubber backed mats, but they are inferior for a number of reasons. Firstly they do not always lie flat on the floor; secondly they become brittle with age as the plasticiser in the PVC vaporises. The embrittlement can cause the edge of a mat to break off. Thirdly PVC becomes stiff as the temperature drops; this makes it difficult for the mats to lie flat if they have recently been stored in, or are being used in a cool place.

Disclosure of Invention

According to one aspect of the present invention there is provided a mat with a tufted textile pile surface comprising tufts of yarn tufted into a tufting substrate and an elastomer backing, characterized in that the rubber backing includes elastomer crumbs and a binder. The process of tufting is well known to those skilled in mat manufacture. The tufting substrate may be of a type commonly used in such construction, for example "Polyback" is a trade name for a woven polypropylene tufting substrate and "Colback" is a trade name for a spun bonded polyester tufting substrate. The elastomer is preferably rubber, most preferably nitrile rubber. This backing material provides better performance than PVC at a cost that may be less than PVC and without the environmental concerns associated with PVC. Nitrile rubber is a term used to describe a compounded rubber mixture of which the main polymeric content is an acrylonitrile butadiene

copolymer. It may also contain fillers such as carbon black, a curing system, plasticisers and other ancillary components.

Also according to the invention there is a mat with a textile surface and an elastomer crumb backing including elastomer crumbs and a binder characterised in that the elastomer crumb backing exhibits a deformability from 8 to 25% as measured by the test herein defined. Preferably the deformability is 10 to 20%. Advantageously the elastomer is rubber; most advantageously it is nitrile rubber.

The invention also includes a mat with a nitrile rubber crumb backing including nitrile rubber crumb and a binder, characterised in that the backing has a density of less than 1g /cm^3.

The mat preferably has a thickness of a least 1 mm. The crumb size may be less than 5 mm diameter. For floor mats it is advantageously in the range 3 to 4 mm.

The invention further provides a mat having an elastomer crumb backing including elastomer crumb and a binder characterised in that the elastomer crumb backing includes at least 10% by weight powdered elastomer crumb. The elastomer crumb is preferably at least partially comprised of crumbed vulcanized rubber. The rubber is preferably nitrile rubber.

The binder may be a polyurethane MDI binder. Preferably it is selected from then group comprising 4,4-methylene di-p-phenylene isocyanate (MDI) polyurethane one component (moisture curing) and two component adhesives. Advantageously the binder is a solvent free one component polyurethane adhesive. Alternatively the binder may be a hot melt binder. The binder is desirably present at a level of from 2 to 12%. When powdered elastomer crumb is included in the backing the binder level preferably lies in the range 9 to 20%, most preferably about 12%.

The backing may include powdered additives selected from the group comprising anti microbial additives, anti flammability additives, pigments, such as iron oxide, and anti-static additives, such as carbon fibres.

In another aspect of the invention there is provided a mat having a textile surface and crumb rubber backing characterised in that a crumb rubber border extending beyond the periphery of the textile surface is provided on at least two opposite edges of the mat. The crumb rubber border may be provided around the entire periphery of the mat.

In a still further aspect of the invention there is an unwashed textile surfaced rubber backed characterised in that the textile surface has a sand retention value as hereinafter defined of at least 1000 g/m^2. Alternatively when the textile surface is a pile surface the mat has a sand retention value of at least twice that of the same unwashed pile surface on a mat made at a temperature and pressure sufficient to vulcanize the rubber backing.

The invention also extends to a mat having an elastomer crumb backing comprising elastomer crumbs and binder characterised in that the binder is a hot melt binder. Again the elastomer is preferably rubber and most preferably nitrile rubber. The hot melt binder is advantageously selected from the group comprising polyurethane reactive hotmelts, copolyester or copolyamide reactive and thermoplastic hotmelts. The level of hotmelt binder is preferably from 5 to 15% by weight of the backing.

The mat may conveniently be a floor mat, a bar runner, or a poster mat.

The elastomer crumb

Throughout this specification the term crumb has the normal meaning in the rubber industry of any "broken down" rubber; thus a crumb of elastomer can be any size in a range which may include powder, granules and chips. In this specification powder means crumb which will pass a 2 mm mesh or crumb with a maximum diameter of 2 mm as the context requires. Granule means crumb that will pass a 6 mm mesh or crumb with a maximum diameter of 6mm, but generally larger than powder, as the context requires. Granules may include some powder but normally granules should have a weight average size that is near to the maximum of the size specification for the granule. Chips means crumbs larger than granules.

The crumb is preferably rubber from recycled industrial mats. It may include some flock from the textile surface of the original mat, perhaps in bonding relationship to the crumb. The flock content should preferably be as low as possible, most preferably less than 10% by weight.

The crumb size may range from about 0.01 to 8 mm. Generally the size will be selected to be as large as possible for the use and properties required. A crumb that passes a 4 mm aperture screen has been found to be useful for floor mats. Crumb size can be chosen to give different amounts of resilience in the mat. The larger the crumb the greater the resilience.

Crumb may be mixed with powder of the same material or a different material to provide a greater tear resistance as the powder increases the tensile strength for a given binder level. The use of other additives in powdered or liquid form provides the same advantage. Suitable additives may be selected from anti microbial materials, anti flammability additives, odorants, colorants or pigments such as iron oxide powder, anti-static additives, such as carbon fibres, fillers and other generally known additives.

The binder

The binder is selected as either a heat setting or thermoplastic type. Depending on the process utilized the binder can be in liquid or powder form. Preferably the binder is selected from one of the following types, Polyurethane reactive hotmelts, Copolyester or copolyamide reactive and thermoplastic hotmelts, 4,4-methylene di-p-phenylene isocyanate (MDI) polyurethane one component (moisture curing) and two component adhesives.

It is important that the binder has good adhesive properties to ensure that the crumb is well bound and that sufficient free binder is capable of forming a physical or chemical bond to the textile surface. The binder should also exhibit sufficient cohesive strength to give the backing sufficient strength. The binder is one that cures or sets at a sufficiently low temperature and pressure that pile crush is substantially avoided

The binder may contain any of the known cross linkers or curing accelerators to suit the process and the desired properties of the mat being manufactured and the rubber being used.

The binder performs the dual function of holding together the crumb backing and bonding the backing to the textile surface of the mat. To perform both functions adequately we have found that binder levels should be in the range 2 to 12% by weight of the crumbs when chips or granules are being used. Use of less than 2% gives a very poor tensile strength in the backing. Use of greater than 12% gives a stiff backing and a skin forms. This reduces the bond strength between the backing and the textile surface. When rubber crumb powder is also added to the backing the amount of binder needed for optimal properties is greater due to the higher surface area of the rubber crumb powder on a weight for weight basis. For powders, especially finer rubber crumb powders of size less than 0.5mm the binder range should lie in the range 9 to 20%, preferably about 12%. Because the powder addition increases the tensile strength a little powder can improve the tensile strength of the backing without increasing the binder content.

The binder may be a liquid polyurethane MDI binder present at a level of from 4 to 12%. The binder may contain further additives such as colorants that are in liquid form and are compatible with the binder, such as plasticisers and perfumes. The binder may also contain other additives such as those listed as crumb additives provided that they are suitable for addition in a liquid medium.

The binder may also be a thermoplastic or thermosetting hot melt powder present at a level from 5 to 15%. A powdered binder may also contain other additives such as those listed as crumb additives provided that they are suitable for addition in a powder medium

The textile surface and the mat

The mat has a textile surface and there may be a border created by allowing the backing to be of a larger area than the textile surface. When borders are provided they may be in the form of a continuous peripheral border around the mat, or two border strips on opposite sides of the mat and no borders at the ends of the mat. The latter construction is preferred for rolls or matting. The width of the mat and other dimensions may be any of those conventionally used for commercial or retail mats or any other suitable dimensions. For mats with low backing thickness it is advantageous to have the textile and the backing cut at the same place. For aesthetic reasons such mats are often provided with what is termed an optical border which is a dark printed area around the periphery of the mat.

Often such commercial or retail floor mats are backed with PVC. The advantage of this mat backed with rubber is that it is similar in cost of production to PVC and has superior appearance and feel to PVC. Furthermore it has much better low temperature flexibility than PVC which means that the rubber crumb backed mats lie better on the floor than PVC backed mats. They are also less liable to become brittle with age than PVC backed mats. In tests we found that the crumb rubber backed mats remained sufficiently flexible to unroll and lie flat immediately after being removed from storage at minus 16°C. Mats according to the invention also unroll more easily than PVC mats at higher temperatures and they may give off less of a distinctive odour of rubber than conventional vulcanized rubber mats. The ability to roll up is very important for commercial mats as they can be as long as 25 m and often are over 6 m long. It is also important for retail mats as they are frequently sold in rolled up form to enable the larger sizes to be carried home. The mats according to the invention were also compared with a PVC backed mat, which was otherwise identical. The lie flatness or amount of rippling of the mat edges after both mats had been rolled up was visibly superior in the mat according to the invention

The mats according to the invention exhibit superior fire resistance to those made from conventional nitrile rubber backing of the same thickness. When tested according to BS4790 mats made from powder nitrile rubber crumb and granule nitrile rubber crumb showed significantly higher resistance to ignition when compared to a mat made from conventional nitrile rubber backing. This is recorded in Table 1.

Table 1

	Regular Mat Rubber	Crumb powder	Crumb granule
Time to extinguish (s)	170	70	50
Radius of effects top (mm)	50	35	25
Radius of effects lower (mm)	50	35	25

This can be further improved by the addition of more binder and/or anti flammability additives to the backing and is especially useful when used in conjunction with a low flammability textile surface. Such a low flammability textile surface may for example be one that is predominantly a woollen construction.

The backing of the mat should be water impermeable. Particularly for a commercial mat which is to be laid in a mat well. This is achieved by appropriate selection of crumb size binder quantity and backing density.

When compared with PVC backed mats the mats of the invention which have 4mm or larger crumb rubber in the backing have better resistance to movement on carpets. On average these

mats according to the invention display significantly improved resistance to movement on carpets compared with PVC backed mats.

Other mats can also be made according to the invention. For example foam sandwich mats.

The inventive mat is suited to the retail and commercial segments. The rental industrial segment is an ideal source of raw material for the crumb because it ensures that low bleed low staining nitrile rubber crumb is used as the starting point for the production of the mats of the invention.

The textile surface is advantageously a tufted pile construction. The binder then provides tuft lock as well as binding the crumbs together. Suitable textile materials include polypropylene, nylon, cotton, blends thereof and any other fibres or yarns that can be tufted into a tufting substrate to form a pile surface. The yarn may be solution dyed or the mats may be printed after they have been manufactured, or during their manufacture.

The invention will now be further described by way of example only and with reference to the drawings, which are briefly described as:

Figure 1 is a cross-sectional side elevation of a mat;

Figure 2 is a top plan view of the mat;

Figure 3 is an enlarged partial bottom view of the mat; and

Figure 4 is a side elevation of a process for manufacturing the mat.

With reference to figures 1 and 2 a mat is shown with tufted pile upper textile surface 1, 4 bonded to a nitrile rubber crumb backing 2. The mat is provided with a rubber crumb border 3, 5. Figure 3 shows the rubber crumb backing in more detail. It generally comprises a series of rubber crumbs 6 bonded together with a binder 7.

Examples of mat products according to the invention are given in Table 2.

Table 2 - Example Products

Property	Polypropylene on Powder	Printed Nylon - optical borders - on Granule	Bar Runner - on Powder	Postermat - on Granule
Textile Type	Polypropylene	Nylon 6	Polyester	Polyester
Weight	600 gm^{-2}	600 gm^{-2}	237 gm^{-2}	200 gm^{-2}
Method	Tufted	Tufted	Knitted	Woven
Tufting Substrate	Polyback	Colback 130	N/A	N/A
Backing Material	0.5mm Powder	6mm Granule	0.5mm Powder	4mm Granule
Thickness	1.5 mm	1.5 mm	1 mm	1.5 mm
Weight	2000 gm^{-2}	2000 gm^{-2}	1333 gm^{-2}	2000 gm^{-2}
Total Weight	2700 gm^{-2}	2730 gm^{-2}	1570 gm^{-2}	2200 gm^{-2}
Borders	15 mm	None	None	None

gm^{-2} is gram per square meter

Figure 4 shows an exemplary process for making mats according to the invention. Rubber crumb 15 or powder 16, or a mixture thereof, is mixed with optional additives and a binder 18 in a mixer 17. The amount of binder varies between 7% and 11% depending on the amount of powder and the amount and type of optional additives. After mixing the crumb 15 and/or powder 16 with the binder 18 the batch is transferred to a spreading means 19. The spread crumb is then introduced to a press and bonded to a tufted pile textile under elevated pressure and temperature.

It will be understood that this process is not intended to be limiting for the invention, although it is the preferred process. It is also feasible to produce the backing in a first process and then to apply the tufted pile in a second process. This overcomes the problem of pile crush caused during compression of the backing but it introduces unwanted process complexity and cost and also means that a separate binder layer is needed to affix the tufted pile textile to the backing.

A suitable method for the manufacture of rubber backed matting is described in EP 0 367 441. This method comprises placing an unvulcanised rubber sheet and textile surface assembly between a hot platen and a pressure applying arrangement with the unvulcanised rubber sheet adjacent the hot platen, wherein the pressure applying arrangement comprises a fluid pressure arrangement in the form of an air bag. A release material, which may be textured, may be provided between the rubber sheet and the hot platen. The preferred construction for the release material is a P.T.F.E. coated woven glass fibre sheet. The cure temperature for nitrile rubber is taught to be in the range 150 to 160°C and the time for cure is 5 to 10 minutes. A suitable pressure in the airbag is said to be one atmosphere above atmospheric: i.e. 1 bar or about 15 psig.

The mats may be easily cut to size if required. The mats provide a higher level of comfort and are lighter than compression mould mats, which are high-density mats.

Example

A batch of 1 to 4 mm nitrile rubber crumb was mixed with 8% MDI binder. The mixture was divided up and sample rubber mat backings were made by spreading the crumb mixture evenly with a thickness of 8 mm and then pressing the mixture using an air bag press at various pressures to produce a series of samples. The pressure ranged from no pressure in the air bag through to 45 psi. All the rubber backing samples so formed were set or pressed at 125°C for 10 minutes. A 25mm square section was then cut from each sample and its thickness and weight was measured. From this the density of the sample was determined. The data is given in table 3.

Table 3 -Density Test Data

Sample ID	Pressure psig	Width mm	Length mm	Thickness mm	Weight g	Volume cm^3	Density g/cm^3
A	0	25	25	8.1	2.8	5.06	0.55
B	2	25	25	6.2	2.8	3.87	0.72
C	4	25	25	5.4	2.6	3.37	0.77
D	8	25	25	5.4	2.9	3.37	0.86
E	16	25	25	5.0	3.2	3.12	1.02
F	32	25	25	4.3	2.8	2.68	1.04
G	45	25	25	3.9	2.7	2.43	1.11
Compress		25	25	7.3	5.0	4.56	1.10
Rubber							1.22

It can be seen from Table 3 that the density increases as the pressure applied increases. The maximum density achieved was 1.1 g/cm^3. Theoretically if the backing sample were 100% compressed the density would be about 1.22 g/cm^3 to match the conventional vulcanized mat backing referred to as "Rubber". The sample referred to as "Compress" is a prior art mat available commercially, which is formed by compression moulding in a fixed platen press rubber crumb to form a very dense backing. From the table it can be seen to be about the same density as we obtained using a 45 psi pressure.

Table 3 also gives a general view of the backing thickness reduction from around 8 mm before to 4 to 5 mm after pressing.

The samples were then tested to determine their deformability. This test is done with a thickness gauge with a 12 mm^2 end. Weight is applied to the measuring plunger of the thickness gauge. First the new backing thickness is measured with 100 g weight and then the thickness is re-measured with a 1000 g weight. The deformability is the percentage fall in the thickness at 100 g loading when the loading pressure is increased to 1000 g.

Table 4 - Deformability test data.

Sample ID	Pressure	100 g	1000 g	Deformability %
A	0	7.65	4.0	47.7
B	2	5.70	4.3	24.6
C	4	5.10	4.2	17.6
D	8	5.30	4.55	14.2
E	16	4.80	4.3	10.4
F	32	4.15	3.75	9.6
G	45	3.70	3.5	5.4
Compress		7.45	7.05	5.4
Rubber		6.10	5.6	8.2

From table 3 it can be seen that there is a correlation between formation pressure and density. From table 4 it can also be seen that there is a correlation between pressure (density) and deformability. The higher the formation pressure the higher the density and the higher the density the lower the deformability.

"Rubber" is a commercially available vulcanised rubber backed industrial mat. The vulcanized rubber is softer and therefore more deformable than the high pressure crumb backings because of the presence of binder in the latter. The binder material is relatively hard, compared with vulcanized rubber.

With compression moulding, the density of the resulting mat is in the range of 80-95% of the density of the material from which the crumb was made. The backing is also harder material than the material from which the crumb was made because of the binder. On the other hand using the process according to the invention, the density can be varied to lie within 50-80% of the density of the material from which the crumb was made. This offers the advantage of a lighter weight mat which is more easily washed and dried and which is easier to carry and transport whilst still being a rubber backed mat. This also has the advantage that product density can be varied by a minor

process change to enable production flexibility. Additives could also be included in the crumb and binder mix to further control or change the density if required.

Low temperature recovery test.

For this test a 300 mm x 200 mm sample of each product to be tested is conditioned at a room temperature of 22°C for 2 hours and then rolled lengthwise around a 40mm diameter tube and secured with a cable tie. The samples are placed in a freezer and kept at a temperature of –16°C for 24 hours. The samples are removed and the cable tie cut. The samples are then left for 10 minutes to relax on a flat, wood surface. Measurements are then made of the height, if any, of the ends of the mat samples above the flat surface due to the curl of the sample. Repeat measurements are made at 20 minutes and 60 minutes.

Table 5 shows the results of the above test when comparing: a conventionally backed nitrile rubber mat (A), a commercially available mat backed with PVC (B), a prior art rubber crumb backed mat formed by compression molding in a fixed platen press to form a very dense backing (C), and a mat backed according to the invention with granulated nitrile rubber crumb (D).

Table 5

	Prior art mats			Inventive mat
	A – Regular Rubber Mat	B - PVC	C – Compression moulded crumb	D –Crumb
+10 minutes	Flat (0mm)	37mm	50mm	10mm
+20 minutes	Flat (0mm)	7mm	6mm	Flat (0mm)
+60 minutes	Flat (0mm)	2mm	2mm	Flat (0mm)

The mat according to the invention outperforms both PVC and the compression moulded rubber crumb mat and it is not significantly different in performance from a high specification regular rubber backed mat.

Sand Retention Test.

For this test two equal size samples of a mat (0.05781 m^2) are cut out. Each sample is weighed. They are then fixed to the inside of a tetrapod chamber. A tetrapod is a known piece of testing equipment used to measure wear of carpeting and the like. 1000 g of dry sand with a particle size distribution as shown in table 6 is added along with five golf balls to provide agitation.

Table 6

Particle size mm	weight %
0 - 0.25	7
0.25 - 0.5	71
0.5 - 0.71	15.7
0.71 - 1.0	3.5
1.0 - 2.0	1.7
2.0 - 2.8	0.16
2.8 - 4.0	0.02
4.0 - 6.7	0
6.7 and above	0

The chamber is then sealed to prevent either the golf balls or the sand leaking out during the test and set revolving for 1000 revolutions. On completion of the test each sample is removed and the weight increase of the sample recorded. The amount of sand retained in each sample is then calculated and expressed as the amount of dry sand retained in g/m².

Two mats with identical pile construction were subjected to this test

Mat A was a Tufted Nylon Cut pile conventional rubber backing which had been fabricated in an air bag press at 165°C and 30 psi.

Mat B was a Tufted Nylon Cut pile with a rubber crumb backing which had also been fabricated in an air bag press but at a lower temperature and pressure. The sand retention results were as follows:

Sample of prior art conventional rubber backed mat A = 723 g/m^2

Sample of crumb rubber backed mat according to the invention mat B = 2655 g/m^2

Production of a conventional rubber backed mat significantly flattens the pile on the mat. Use of the lower temperature and pressure possible when using the same type of air bag pressurised, heated platen equipment to produce a rubber crumb backed textile pile faced mat according to the invention does not. This gives a mat, which immediately after manufacture has good dust control properties without being laundered. This good dust control performance is exemplified by a sand retention value in excess of 1000 g/m^2, even in excess of 2000 g/m^2 for the typical nylon tufted pile used in this test. The sand retention for a mat according to the invention is at least twice the sand retention for an equivalent pile prior art mat. The uncrushed pile also exhibits better "feel" by way of a more luxurious texture.

Claims

1. A mat with a tufted textile pile surface comprising tufts of yarn tufted into a tufting substrate and an elastomer backing, characterized in that the rubber backing includes elastomer crumbs and a binder.

2. A mat according to claim 1 wherein the elastomer is rubber.

3. A mat according to claim 2 wherein the rubber is nitrile rubber.

4. A mat with a textile surface and an elastomer crumb backing including elastomer crumbs and a binder characterised in that the elastomer crumb backing exhibits a deformability from 8 to 25% as measured by the test herein defined.

5. A mat according to claim 4 with a deformability of from 10 to 20%.

6. A mat according to claim 4 or 5 wherein the elastomer is rubber.

7. A mat according to claim 6 wherein the rubber is nitrile rubber.

8. A mat with a nitrile rubber crumb backing including nitrile rubber crumb and a binder, characterised in that the backing has a density of less than 1g /cm^3.

9. A mat according to any preceding claim in which the backing has a thickness of a least 1 mm.

10. A mat according to any preceding claim in which the crumb size is less than 5 mm diameter.

11. A mat according to any preceding claim in which the crumb size is substantially in the range 3 to 4 mm.

12. A mat having an elastomer crumb backing including elastomer crumb and a binder characterised in that the elastomer crumb backing includes at least 10% by weight powdered elastomer crumb.

13. A mat according to claim 12 wherein the elastomer crumb is crumbed vulcanized rubber.

14. A mat according to claim 13 wherein the rubber is nitrile rubber.

15. A mat according to any preceding claim in which the binder is a polyurethane MDI binder.

16. A mat according to claim 15 in which the binder is selected from the group comprising 4,4-methylene di-p-phenylene isocyanate (MDI) polyurethane one component (moisture curing) and two component adhesives.

17. A mat according to claim 15 in which the binder is a solvent free one component polyurethane adhesive.

18. A mat according to any one of claims 1 to 14 in which the binder is a hot melt binder.

19. A mat according to any preceding claim in which the binder is present at a level of from 2 to 12%.

20. A mat according to any preceding claim in which the backing includes powdered additives selected from the group comprising anti microbial additives, anti flammability additives, pigments, such as iron oxide, and anti-static additives, such as carbon fibres.

21. A mat according to claim 20 in which the binder level lies in the range 9 to 20%, preferably about 12%.

22. A mat having a textile surface and crumb rubber backing characterised in that a crumb rubber border extending beyond the periphery of the textile surface is provided on at least two opposite edges of the mat.

23. A mat according to claim 22 comprising a crumb rubber border around the entire periphery of the mat.

24. An unwashed textile surfaced rubber backed mat characterised in that the textile surface has a sand retention value of at least 1000 g/m^2.

25. An unwashed textile surfaced rubber backed mat characterised in that the textile surface is tufted pile textile surface which exhibits at least twice the sand retention value of the same unwashed surface on a mat made at a temperature and pressure needed to vulcanize the rubber backing.

26. A mat having an elastomer crumb backing comprising elastomer crumbs and binder characterised in that the binder is a hot melt binder.

27. A mat according to claim 26 wherein the elastomer is rubber.

28. A mat according to claim 27 wherein the rubber is nitrile rubber.

29. A mat according to any one of claims 26 to 28 wherein the hot melt binder is selected from the group comprising polyurethane reactive hotmelts, copolyester or copolyamide reactive and thermoplastic hotmelts.

30. A mat according to any one of claims 26 to 29 wherein the binder level is from 5 to 15% by weight of the backing.

31. A mat according to any preceding claim which is a floor mat

32. A mat according to any preceding claim which is a bar runner.

33. A mat according to any preceding claim which is a poster mat.

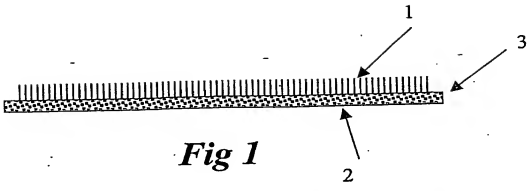

Fig 1

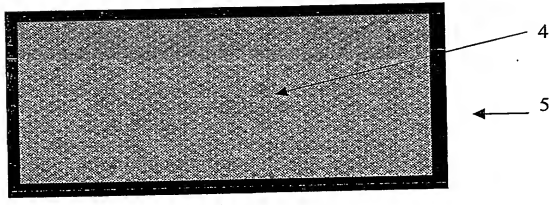

Fig 2

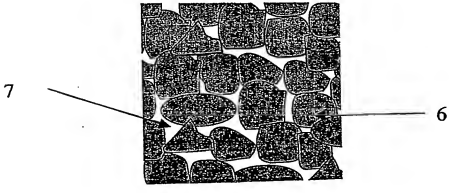

Fig 3

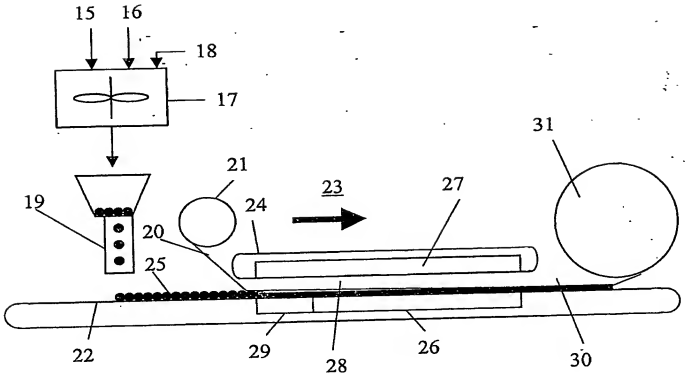

Fig 4